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Revised

Drinking Water Sampling and Alternate Water Supply Work Plan
J. H. Baxter Arlington Plant
Arlington, Washington

HARTCROWSER
Delivering smarter solutions

Prepared for
J. H. Baxter

June 18, 2001
7026-04

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DRINKING WATER SAMPLING AND ALTERNATE WATER SUPPLY WORK PLAN
J. H. BAXTER ARLINGTON PLANT
ARLINGTON, WASHINGTON

INTRODUCTION

This document outlines the proposed Drinking Water Sampling and Alternate Water Supply Work Plan for the J. H. Baxter Arlington Plant. This Work Plan is intended to fulfill the requirements set forth by paragraph 51 of the United States Environmental Protection Agency Administrative Order on Consent (EPA, 2001).

The purpose of this Work Plan is to describe the tasks that will be undertaken to sample drinking water wells in the vicinity of the Baxter facility (See Figure 1), and if contamination is detected, promptly provide an alternate water supply.

The Drinking Water Sampling and Alternate Water Supply Work Plan includes five sections as follows:

- The Introduction outlines the site operations, hydrogeology affecting groundwater flow, and the previous work completed to assess water supply wells in the vicinity of the site. The previous work is only included as background data for use in completing the new inventory.
- The Drinking Water Sampling Plan describes the process that will be undertaken as part of this AOC to identify the occurrence of water supply wells in the area, and the methodology, parameters, and schedule for the sampling and analysis and periodic resampling of the water supply wells within the sampling area boundary.
- The Alternate Water Supply Plan outlines the contingency plans to supply an alternate source of water should any water supply well be found to be contaminated.
- The last two sections summarize the plans for Documentation and the Schedule for completing the activities identified in this Plan.

Site Description

The J. H. Baxter (Baxter) wood preserving facility is a 52-acre pole processing and preservation plant. The site lies just southwest of the intersection of 67th Avenue NE and NE 188th Street as shown on Figure 1.

Baxter has operated a wood treating facility at the site since 1970, producing utility poles treated with the preservative, pentachlorophenol (PCP). Baxter's operation includes the stockpiling and processing of raw logs. These logs are processed by debarking, trimming, marking, seasoning, and then finally by treating. The treatment occurs by placing prepared poles in either pressure retorts, which treat the entire pole, or in a dip tank that treats the butt ends. The treating solution includes a mixture of 5 to 6 percent PCP dissolved in an aromatic oil solution. PCP has been detected in soil samples on the site and in some of the site's groundwater monitoring wells.

Regional Hydrogeology

The Baxter facility is situated within the Marysville trough, a broad outwash plain located generally between Arlington and Marysville, Washington. The trough was originally carved out by river and glacial erosion; then subsequently filled in with a thick sequence of coarse-grained glacial meltwater deposits placed as the last glacier retreated from the area. The coarse-grained recessional outwash deposits, described as the Marysville sand member (Qvrm) by Minard (1985) and Newcomb (1952) are estimated to be at least 100 feet thick in the area of the site. Figure 2 presents a hydrogeologic cross section showing the regional occurrence of the Qvrm materials relative to the site.

The Getchell Hill upland lies to the east of the site. The upland includes a till cap overlying a relatively thick sequence of advance outwash. The advance outwash (Qva) was mapped by Minard (1985) to occur from the valley floor to elevations over 250 feet. The predominantly sand unit is underlain by fine sand, silt, and clay of the transitional beds unit (Qtb). The water level data for the Baxter site indicates that the deposits within the east hillside recharge the Qvrm outwash aquifer beneath the site.

The recessional outwash deposits form a broad plain resulting in topography that is largely flat. Little or no natural drainage occurs within the outwash because of the relatively high infiltration capacity of the native sands and gravels. Because of this geology, it is common practice in the area to infiltrate stormwater. The closest drainage feature is Portage Creek, a tributary to the Stillaguamish River. Portage Creek lies approximately 5,000 feet north of the site and is likely the principal discharge point for groundwater within the outwash aquifer in the area of the Baxter facility. Springs, mapped in the Portage Creek valley wall by Newcomb (1952), evidence this discharge.

Site Hydrogeology

The principal aquifer beneath the site lies within the recessional outwash deposits. Groundwater is encountered within these deposits at depths of between 10 and 40 feet around the Baxter facility. Depth to water is shallowest beneath the southeast portion of the facility and deepest beneath the northwest facility area. Seasonal water level fluctuations average about 4 to 5 feet; however, fluctuations of 10 to 20 feet have been observed due to longer-term precipitation cycles. The groundwater flow direction beneath the Baxter facility for the last 10 years has consistently been to the northwest. Figure 3 presents a snapshot of the groundwater flow pattern across the site during typical wet and dry seasons.

The outwash aquifer beneath the Baxter facility includes two layers of distinct material type within which the water table fluctuates. The upper layer includes gravelly sand to sandy gravel with very little silt. This layer generally occurs to a depth of 15 to 25 feet and is only consistently saturated in the southeast portion of the facility. Below the sand and gravel is a layer that is comprised predominately of fine to medium sand. Groundwater flows within this unit across the entire site. This unit occurs to at least a depth of 40 feet. Within both of these layers are interbedded coarser and finer layers.

The hydraulic conductivity of these layers range from 2 to 20 feet per day within the fine sand layer, and between 100 to 150 feet per day within the coarser, gravelly sand layer. Groundwater flow rates, assuming a porosity of 0.30 and October 1999 gradients, range between 0.4 and 5 feet/day for the fine sand unit in northwest site area and 0.2 to 2 feet/day for the southeast portion of the site. Flow rates as large as 8 feet/day may occur locally during the high water periods within the coarser sand and gravel layer.

Summary of Previous Work

Two previous well inventories were conducted for the community surrounding the Baxter facility; Sweet-Edwards completed the first in 1988, and Hart Crowser completed the second in 2000. The Beneficial Use Survey, conducted by Sweet-Edwards identified 35 wells, 14 of which are within a 2,000-foot radius of the Baxter facility (See Figure 2 of Appendix A report). Within this radius, 12 of the 14 wells are located hydraulically upgradient of the site. The two downgradient wells were identified in the neighboring trailer park and near the intersection of 59th Avenue NE and 188th Street NE. Since the time of the Sweet Edwards study, the trailer park well was properly decommissioned by Baxter, and the well near 59th and 188th is no longer in use according to a homeowner interviewed

by Hart Crowser in 2000. The status of all wells will be assessed and summarized as part of the upcoming well inventory.

The Water Use Survey conducted by Hart Crowser did not identify any additional domestic wells not already accounted for by the Beneficial Use Survey or Ecology well log files. A memo summarizing the Water Use Survey and the Beneficial Use Survey is included as Appendix A.

Note that these data are only provided as background information for the well inventory proposed to be completed under this Work Plan. We understand that the previous well inventories were not adequate for identifying all water wells being used, or which could be used, in the project area as required by the AOC. A new water well inventory is planned as outlined in **THE DRINKING WATER SAMPLING PLAN** section below.

THE DRINKING WATER SAMPLING PLAN

The Drinking Water Sampling Plan describes the tasks and schedule that will be taken by Baxter for locating and sampling water wells per Paragraph 51 of the Administrative Order on Consent (AOC). With regard to the Drinking Water Supply sampling, this paragraph stipulates the following:

a. Development of a plan and schedule for the initial sampling and periodic resampling of every water supply well within the area shown on Figure 1;

b. Analysis of the water samples for chlorinated phenols (PCP and tetrachlorophenol);

c. Provision of validated results to well users and EPA, as soon as possible, but not later than thirty (30) days of sample collection; and

d. Quarterly sampling for any well in which PCP is detected.

The work will be accomplished in two steps beginning with a detailed water well inventory. Once the inventory is completed and all known water supply wells have been identified, the sampling will occur. The specific methodology for locating and sampling wells is described below.

Well Inventory

A detailed water well inventory will be performed on the area surrounding the Baxter facility to identify and locate all water supply wells within the sampling boundary. The boundaries of the area to be surveyed is defined as:

- North to the southern edge of the Portage Creek Basin, then south to the northern boundary line of section 15 (204th Street NE);
- South to Greenwood Sisco Road, which correlates to the southern boundary line of Section 22, except for a 2,000- by 2,000-foot area in the southeast corner of Section 22;
- East to 67th Avenue NE (eastern boundary line of Sections 15 and 22) including all water wells east of 67th Avenue NE between 188th Street NE and the first well south of 180th Place; and
- West to the western boundary line of Sections 15 and 22.

The inventory will consist of two tasks: Data Compilation, and Field Confirmation. Components of each task are outlined below.

Data Compilation

All available records that might identify the existence of a water supply well will be collected and reviewed. The sources that will be used include, but are not limited to:

- Previous well inventories conducted by Sweet-Edwards (1989) and Hart Crowser (2000);
- Washington State Department of Ecology well logs for the sampling area;
- Washington State Department of Ecology Water Rights Application Tracking System (WRATS);
- City of Arlington Department of Public Works water line maps and service records as available; and
- Washington Department of Health and Transportation geographic information system (GIS) database(s).

The data collected will be compiled and evaluated to identify all potential water wells. We will sort out ownership history as necessary to ascertain any duplicate water wells in these data sources. Preliminary results will be mapped and tabulated for use during the field confirmation.

We will use the City records on water lines and water meters to ascertain where and when City water was installed. We will use the dates when waterlines were installed in conjunction with historical maps for the area to identify those homes that existed prior to installation of City water. These older homes are the most likely to have a well, which may or may not be operable.

Field Confirmation

Results from the data compilation will be used in the field for confirmation of current status and well location. We will use the compiled maps and tables along with City of Arlington water line information to target areas where a "door to door" survey will be conducted. Focus will be in neighborhoods and at homes that predate the installation of city water lines. Supply wells within the sampling boundary but not identified in the data compilation, will be sampled as required by the AOC.

We will interview the property owner, visit the well, and obtain as much information as possible about the well. Information that will be sought includes: property water source (i.e., city supply or well), well use history, well depth and screened interval, current condition, and pump condition. The gathered information will be documented on the Field Well Inventory Sheet as presented in Appendix B. Arrangements will also be made at the time of the interview with the property owner to sample the well at a later date.

Selection of Wells for Sampling

Any water well identified during the inventory that is used, or could be used, as a source of water for drinking or irrigation will be sampled. Monitoring wells that are identified on industrial or commercial facilities will not be sampled, unless they are used, or could be used, as a water supply source.

If the well does not have an operating pump and the well casing is not accessible to sampling equipment, the well will not be sampled. Specific details about well condition or completion hindering the sampling effort will be documented.

During the well inventory, we will determine the specific sampling location and procedures to be used in sampling each water supply well. The intent will be to conduct the initial sampling of all identified water supply wells within a few days of completing the inventory, although this may vary somewhat based on owner access issues.

The specific procedures for sampling and analysis will be used for the initial sampling and all subsequent sampling. After the initial sampling, the water supply wells will be resampled approximately 6 months later, assuming there are no detections of PCP. Semi-annual sampling will continue until each water supply well has no detections of PCP for a two-year period. If PCP is detected in any water supply well, the sampling frequency will be increased to quarterly, and the actions described in the Alternate Water Supply Plan will take effect.

Sampling Procedures

The following sampling procedures will be used depending on completion of the water supply well selected for sampling. Details about each well sampling will be recorded on the Groundwater Sampling Data form presented in Appendix B.

Measurement of Groundwater Levels

If access is available to the well casing, depth to water will be measured. Measurements will be made to the nearest 0.01 foot using an electronic sounder.

Purge

If the water supply well is an active well with an installed and operating pump, the tap closest to the wellhead will be selected for sampling. The water will be allowed to run for 2 to 3 minutes to flush the lines. If a pressure-equalizing tank is located before the closest tap, the approximated volume of the tank will be flushed.

If the water supply well does not have an operating pump and is intended for future water supply, the well will be purged and sampled with a peristaltic pump if water levels are sufficiently shallow (i.e. less than 25 feet), a submersible pump if access is available, or a disposable bailer if there is not sufficient access to install a submersible pump.

Purging will be considered complete when at least one casing volume has been removed from the well and field parameters have stabilized. Any monitoring wells sampled will be purged by removing at least three casing volumes of water until field parameters have stabilized.

During purging, water will be collected periodically for measurement of temperature, pH, and conductivity. Once the field parameters stabilize, the sample will be collected for chemical analysis.

Purge water will be disposed of on the ground unless an odor, sheen, or other obvious contamination is indicated.

Sample Collection

Following completion of the purging procedure, an unfiltered groundwater sample will be collected from the spigot or tap closest to the well, or in the case of wells without pumps, from the port of the installed pump, or if a bailer is needed as outlined above, poured from the bailer. Sample containers provided by the analytical laboratory specially prepared for chlorinated phenols will be used to collect the sample.

Sample Handling

All sample containers will be marked with the owner name and address, date of collection, and sampler's initials. Groundwater samples will be stored in a cooler (with ice) during transport to the analytical laboratory. Chain of Custody will be maintained and documented throughout the sample collection and shipment process.

Chemical Analysis

Samples collected from water supply wells will be transported to Columbia Analytical Services, Inc. in Kelso, WA for analysis by EPA Method 8151 modified to include PCP and tetrachlorophenol. The QA/QC procedures to be used in the field and laboratory are presented in Appendix C.

Reporting of Chemical Analysis Results

Validated sample analytical results will be provided to the property owner and to the EPA Project Manager as soon as possible, but no later than thirty (30) days of sample collection.

Other information including well inventory tables and maps will be summarized and included in the monthly reports to EPA as required by Section XI Periodic Reporting, of the AOC and in the final Drinking Water Sampling and Alternate Water Sampling Report (see Documentation section).

THE ALTERNATE WATER SUPPLY PLAN

The Alternate Water Supply Plan outlines the response actions that will be taken to address the detection of PCP in any of the water supply wells. Per Paragraph 51 of the AOC, the Alternative Water Supply Plan must include the following:

a. 1) a schedule for provision of alternate drinking water (such as bottled water) to all of the users of every well contaminated with PCP at detectable levels; 2) full replacement of water used for any purpose (a "whole house" safe water supply for the residence or other building or location) for any well at which PCP exceeds 1.0 µg/L; and 3) description of other response actions that may be appropriate (e.g. shutting off water to public drinking fountain).

b. In the event that provision of alternate water supply is required, providing documentation to EPA as part of its monthly reporting obligation

c. In the event that analysis of groundwater samples collected from any well available for human consumption are contaminated with PCP above 1 µg/L (ppb), providing signs that may be posted by the property owner within seven (7) days of the date that validated sample results are received.

d. Provision of alternate water supply, and sampling and analysis of each well required to be sampled, shall continue until no PCP is detected in any well continuously for a two year period, unless otherwise specified by EPA.

e. The submission of an Alternate Water Supply Report which, at a minimum, documents compliance with the requirements set forth in paragraph 51 of the AOC.

Provisions to Supply Water

There are two potential scenarios in which water may need to be supplied to property owners: 1) if validated sample results indicate detectable concentrations of PCP; and 2) if validated sample results exceed 1.0 micrograms/Liter PCP. In both instances, a similar approach will be taken:

- Within 3 business days of receiving validated sample results that indicate PCP was detected, confirmation samples will be collected from the water supply well;
- Within 3 business days of receiving validated sample results, an alternative water supply will be provided to the impacted property owner and
- Other response actions, as appropriate (e.g., shutting off water to public drinking fountain), will be performed, subject to the approval of EPA.

Confirmation Sampling and Analysis

If validated water well sample analytical results indicate PCP concentrations at detectable concentrations, a confirmation sample will be collected to verify the occurrence of PCP in the water from the well. Confirmation samples will be collected in accordance with the QA/QC Plan. A one-week rush turnaround will be requested from the laboratory.

If PCP is not detected in the results of the validated confirmation sample, an additional confirmation sample will be collected to help resolve whether PCP is present in the water well, or whether the initial detection was a sampling/ laboratory anomaly. The results of the third confirmation sampling will provide the trigger for maintenance of alternative water supply. If there are two detections, alternative water supply will be continued and quarterly sampling will begin. If there are two non-detections, we will discuss with EPA the need for continued alternative supply and EPA will determine whether an alternate water supply must begin or be continued. In any case, quarterly monitoring will commence in each well at which PCP is detected, regardless of the results of the confirmation sampling.

Alternative Water Supply

Within 3 business days of receiving validated sample results indicating concentrations of PCP in the water supply well, an alternative water supply will be provided to the property owner. The type of alternative water supply will be in part dependent on the concentration of PCP in the water.

Detectable Concentrations of PCP

If a detectable concentration of PCP (detection limit 0.5 micrograms/Liter) is validated in a sample collected from a water supply well, within 3 business days, bottled water, or a similar drinking water supply, will be provided to the property owner to meet his drinking water consumption needs of the property owners/users.

PCP Concentrations Exceeding 1.0 micrograms/Liter

If a detectable concentration of PCP exceeds 1 micrograms/Liter in a validated sample result, within 3 business days, a water supply for necessary consumptive uses (e.g., drinking, bathing, cloth washing, etc.) will be provided to the property owner/user(s). Depending on the location of the water supply system and the volume of water needed, the water supply may take one of several forms (e.g., refillable tank plumbed into the house water system, hook-up to the city water supply system, or water treatment system). Determination of the appropriate system will be made with the approval of EPA.

Other Response Actions

As appropriate and necessary, other response actions will be taken if PCP is detected in a water supply well. The specific nature of these actions will be highly dependent on the location and use of the water supply well. For instance, if a property has an office building with a public drinking water fountain, the fountain would be shut off. Similarly, at a residential property, outside water taps may be shut off to prevent the use of these taps for drinking water by non-property residents.

Long-Term Alternative Water Supply

A feasibility analysis of the alternatives for a permanent replacement system will be completed concurrently with the Corrective Measures Study for the site contamination or at such time as EPA requires. The analysis will include identification of potentially applicable alternatives, a feasibility screening of alternatives, and a detailed analysis of the preferred alternative. The results will be documented in the Drinking Water Sampling and Alternate Water Supply Report.

Reporting on Water Supply Provision

Documentation of the alternative water supply will be provided to the EPA as part of the monthly reporting required by Section XI of the Order. As appropriate and available, this documentation will be in the form of purchase receipts, invoices, etc. to show both the method of supply, the volume of water supplied, and the cost for the supply.

Signage

If a water supply well contains PCP above 1 micrograms/Liter, Baxter will provide signs for the well, spigot, water hydrant, public toilet, water cooler, and

other locations (e.g., sprinklers) where there may be human consumption of the water. The signs will be provided within 7 days of the date that we receive validated sample results. The signs will be at least 6 x 12 inches and will be made of waterproof material with a white or brightly colored background and clearly contrasting lettering. The signs will be made in English or any other language specified by the well user.

The sign will state: **"Warning: This water is contaminated and unsafe for consumption. Do not drink"**; and EPA contact information will be provided.

Ongoing Sampling of PCP-Impacted Water Wells

If PCP concentrations are confirmed in any well that is required to be sampled, sampling and analysis will be continued on a quarterly basis for a 2-year period until the Corrective Measures Implementation Report is approved by EPA, or until determined by EPA to no longer be necessary.

DOCUMENTATION

In addition to the periodic reporting of sampling results and water supply documentation, a Drinking Water Sampling and Alternative Water Supply Report will be submitted 30 days after submission of the Corrective Measures Implementation Report. The report will include a summary of the activities conducted under this plan and document compliance with Paragraph 51 of the AOC.

The basic content of the Drinking Water Sampling and Alternative Water Supply Report will include the following:

- **Executive Summary.**
- **Introduction.** Provide the purpose of the report, an outline of its contents, and summary of the scope of work conducted.
- **Sampling Results.** Discuss the sampling activities and the analytical results; the results may or may not have led to the need for an alternative water supply; the results may conclude based on the 2 years of semi-annual monitoring that no drinking water wells are being impacted by the Baxter site conditions.

If an alternative water supply was required based on the sampling and analysis results, the report will continue with:

- **Initial Actions Taken.** Summary of the initial actions taken to provide water to the property owner and to prevent impacted water from being used improperly;
- **Implementation of Alternative Water Supply.** Discussion of how a permanent water supply was selected and will be implemented; and
- **Future Actions.** Discussion of what actions will be taken in the future for monitoring and discontinuing the alternative water supply.

SCHEDULE

Unless otherwise specified by EPA, the following tasks will take place by the dates specified in the schedule.

Activity	Schedule
Submittal of the Drinking Water Sampling and Alternate Water Supply Work Plan	June 15, 2001
Complete Well Inventory	June 25, 2001
Complete Initial Well Sampling	July 2, 2001
Submit Validated Sampling Results	For each sample, as soon as possible, but no later than 30 days of sample collection date for that sample
Resample wells with no detectable PCP	6 months following the first sampling event
Provide alternative drinking water to PCP-impacted wells	Within 3 business days of validated sampling results for that specific well
Resample wells with detectable PCP	Quarterly following the confirmation sampling
Provide signage to impacted water supplies	Within 7 days of validated sampling results for that specific well
Evaluate Permanent Replacement Water Supplies	On-going during sampling period
Submit Drinking Water Sampling and Alternate Water Supply Report	Within 30 days of Corrective Measures Implementation Report or unless otherwise specified by EPA

REFERENCES

EMCON (formerly Sweet-Edwards/EMCON), 1989. Hydrogeologic Report, J. H. Baxter South Woodwaste Landfill, Arlington, Washington. Prepared by Sweet-Edwards/EMCON. January.

EPA, 1994a. National Functional Guidelines for Inorganic Data Review.

EPA, 1994b. National Functional Guidelines for Organic Data Review.

EPA, 2001. Administrative Order on Consent, U.S. EPA, Region 10 Docket No. RCRA-10-2001-0086.

Hart Crowser, 2000. Draft Remedial Investigation Report, J. H. Baxter Arlington Plant, Prepared by Hart Crowser. March 10, 2000.

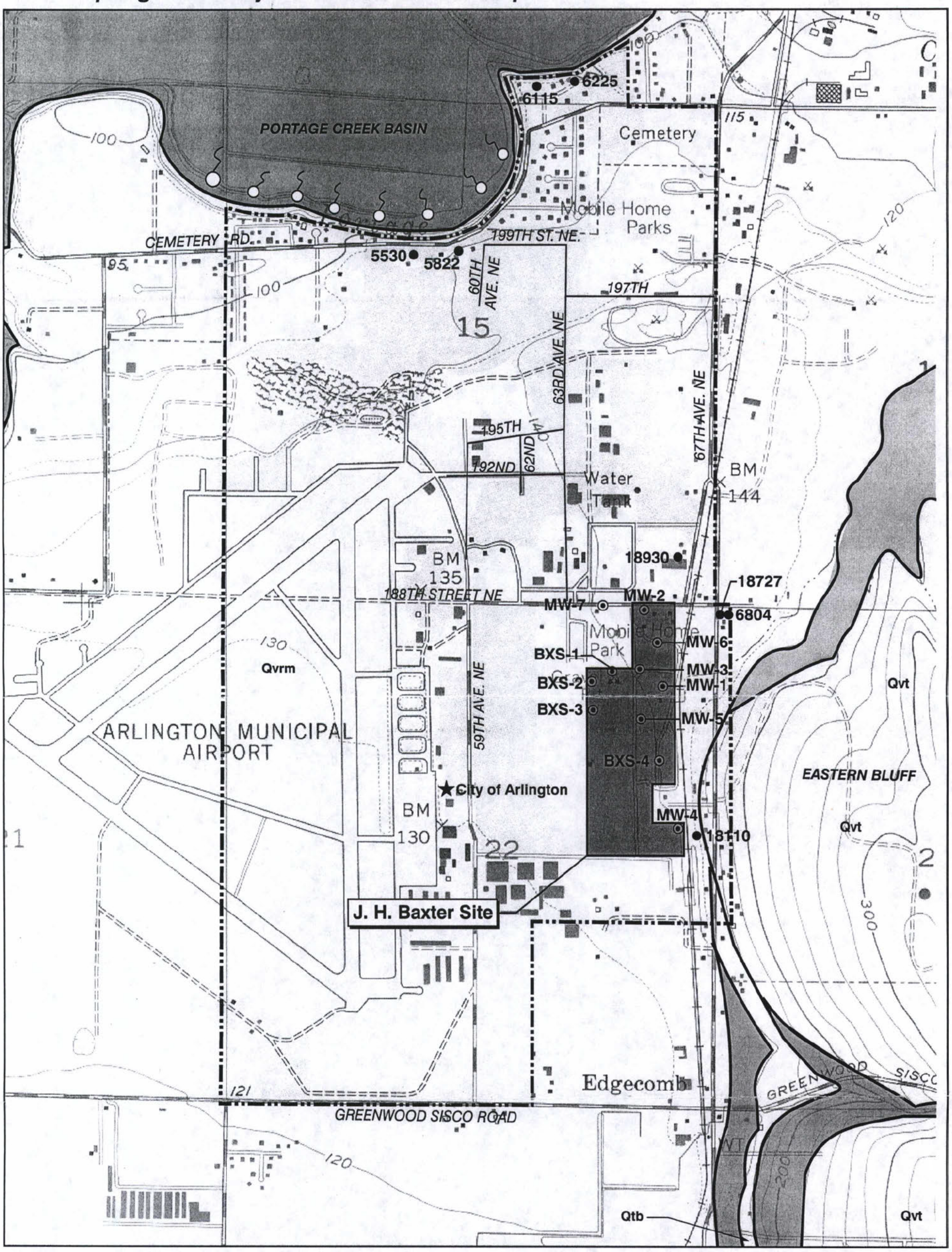
Hart Crowser, 2001. Memorandum: Water Use Survey, J. H. Baxter – Arlington, Washington. January 30, 2001.

Minard, J.P., 1985. Geologic Map of the Arlington West Quadrangle, Snohomish County, Washington. US Geological Survey Map MF-1740.

Newcomb, R.C., 1952. Groundwater Resources of Snohomish County, Washington. US Geological Survey Water Supply Paper 1135.

F:\docs\jobs\702604\DrinkingWaterSamplingPlan.doc

Sampling Boundary and Well Location Map



Notes:
Base map prepared from USGS 7.5 minute quadrangle map of Arlington West, Washington, dated 1981. Township 31N, Range 5E.

● **6803** Wells Previously Field Located by Hart Crowser (2000) (Number Identifies Well Street Address)

Groundwater Discharge Area

⊙ **MW-1** Baxter Site Monitoring Well Location and Number

★ City of Arlington Water Supply Well

Water Well Sampling Boundary

N

0 1000 2000

Scale in Feet

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Figure 1

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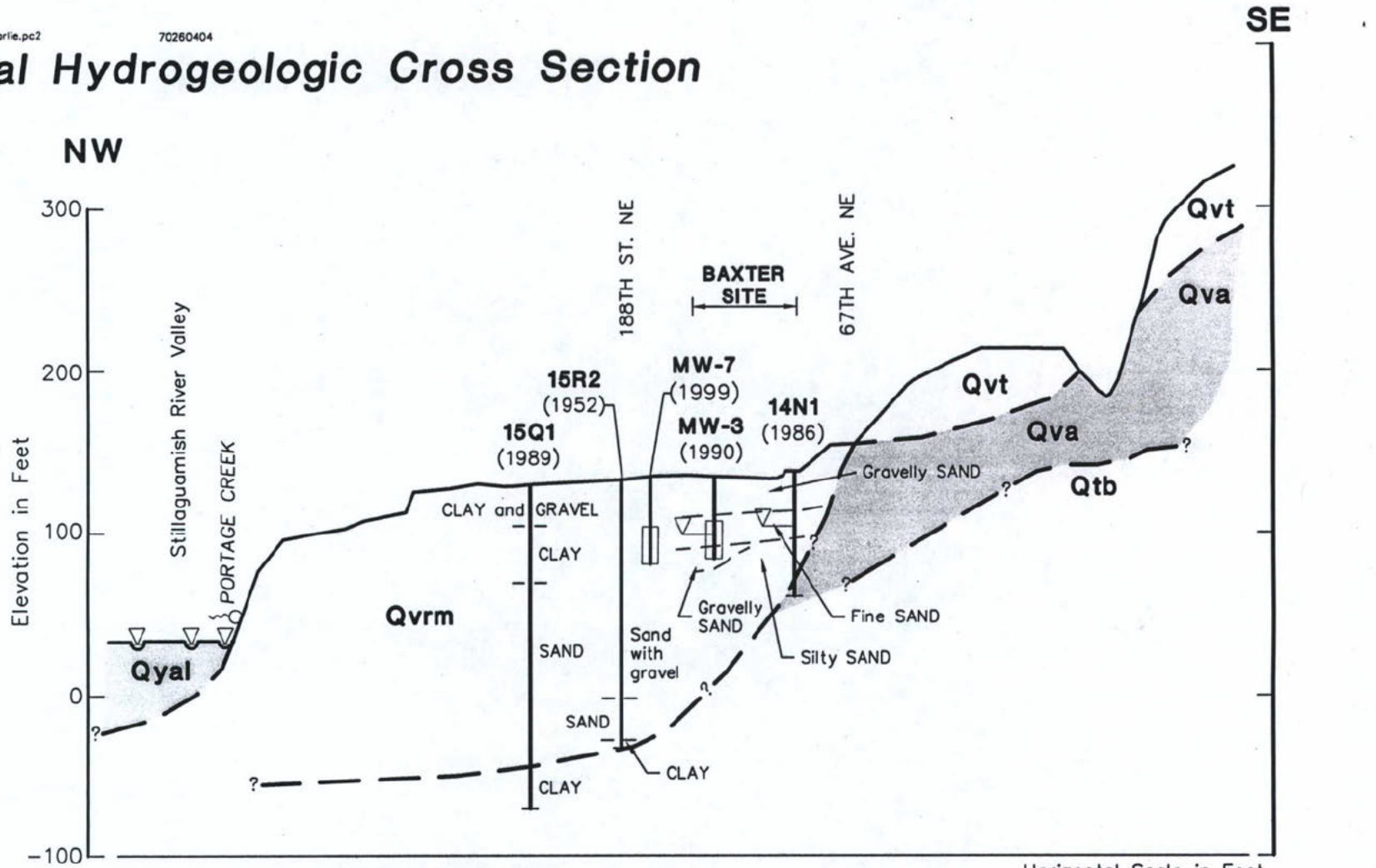
DTN 5/1/01 1=2000 charlie.pc2 70260404

Regional Hydrogeologic Cross Section



Note: Contacts between soil units are based upon interpolation between borings and represent our interpretation of subsurface conditions based on currently available data.

Horizontal Scale in Feet
0 2000 4000
0 100 200
Vertical Scale in Feet
Vertical Exaggeration x 20

15R2 (1952) Exploration Number (Date of Log or Data Source)

Exploration Location

Water Level

Screened Interval (When available)

Seep

Geologic Units from Minard (1985)

Qyal	Younger Alluvium
Qvrm	Recessional Outwash – Marysville Member
Qvt	Till
Qva	Advance Outwash
Qtb	Transitional Beds Silt

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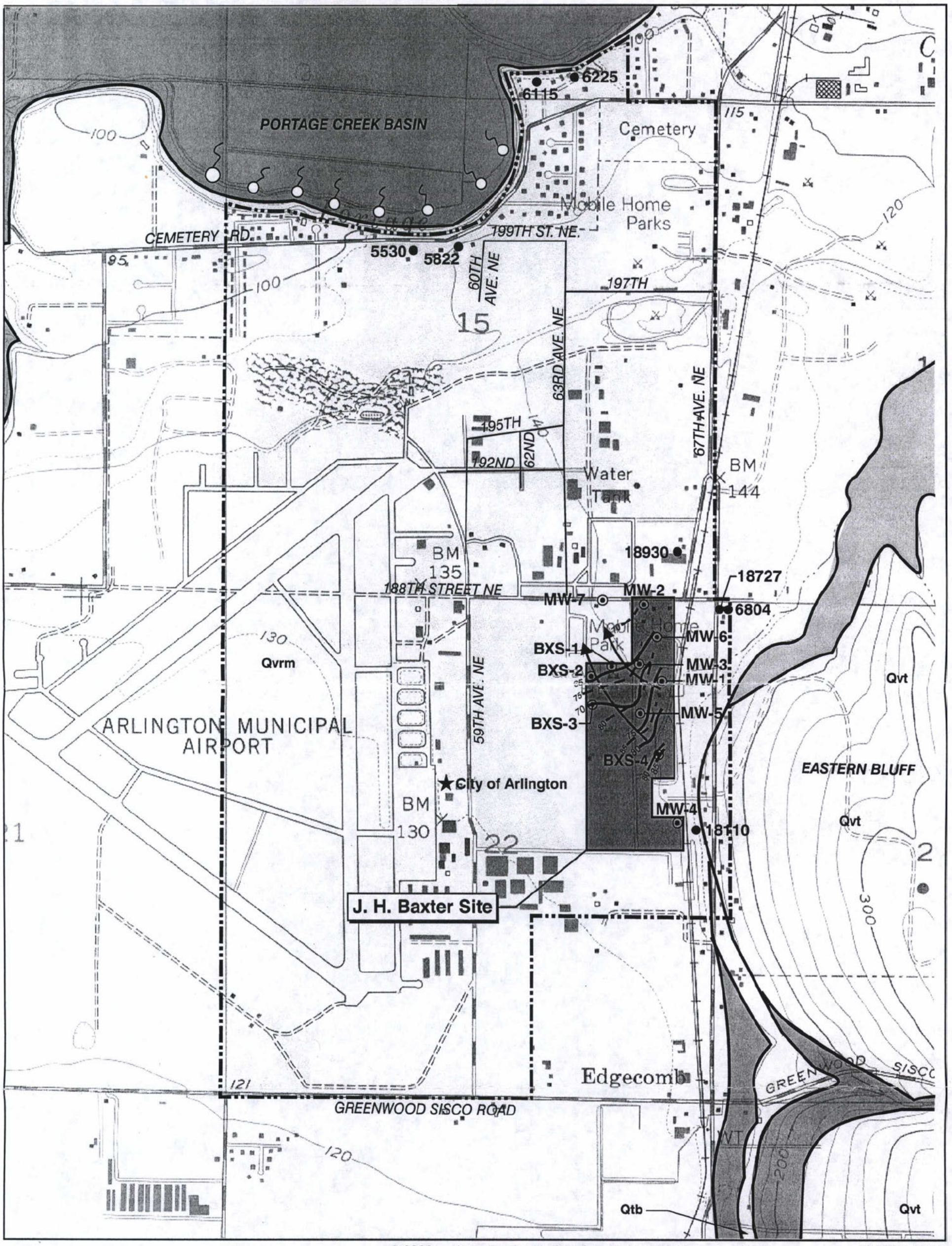
J-7026-04 5/01

Figure 2

Groundwater Elevation Contour Map



Notes:
Base map prepared from USGS 7.5 minute quadrangle map of Arlington West, Washington, dated 1981. Township 31N, Range 5E.

DTN 702604X.cdr 6/18/01

● 6803 Wells Previously Field Located by Hart Crowser (2000) (Number Identifies Well Street Address)

Groundwater Discharge Area

◉ MW-1 Baxter Site Monitoring Well Location and Number

★ City of Arlington Water Supply Well

Water Well Sampling Boundary

70 Groundwater Contour (October 1999)

80 Groundwater Contour (April 1997)

Groundwater Flow Direction

N

0 1000 2000
Scale in Feet

HARTCROWSER
J-7026-04 5/01
Figure 3

APPENDIX A
WATER USE SURVEY MEMO
(HART CROWSER, 2001)

HARTCROWSER

MEMORANDUM

DATE: January 30, 2001

TO: Lori Herman, Hart Crowser, Inc.

FROM: Jeremy Porter, Hart Crowser, Inc.

RE: **Water Use Survey**
J. H. Baxter - Arlington, Washington
J-7026-04

This memorandum outlines the procedures used in the Area Water Well Survey performed by Hart Crowser for the Draft Remedial Investigation Report for the J. H. Baxter Arlington Plant, dated March 10, 2000 (Draft RI). A summary of the results of the water well survey is provided on page 4 of the Draft RI.

RECORDS REVIEW

We created a database of potential well locations in the Baxter site area using the following sources:

- Washington State Department of Ecology (Ecology) well logs, for Sections 14, 15, 16, 17, 20, 21, 22, 23, 26, 27, 28, and 29 of Township 31 North, Range 5 East.
- Sweet-Edwards/Emcon Beneficial Use Survey within a one-mile radius of the site, conducted in 1989 (Hydrogeologic Report, J. H. Baxter South Woodwaste Landfill, Arlington, Washington, January 1989). A copy of the results of this survey is attached.
- Ecology survey data (Memorandum from Christine Corrigan, 1999).
- Interview with Terry Castle, City of Arlington Department of Public Works Director. Discussed the location of water lines and his knowledge of any recent construction which may have installed water wells instead of using City of Arlington water supplies. Mr. Castle indicated there were no new wells in the valley near either 67th Avenue NE or NE 188th Street since the time of water main installation.

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Seattle, Washington 98102-3699
Fax: 206.328.5581
Tel: 206.324.9530

FIELD SURVEY

On February 5, 2000, Jeremy Porter of Hart Crowser conducted a field inventory of wells in the Baxter area, with the following goals:

- Determine the status of wells within one mile of the site that were listed in the Ecology well log database or the Sweet-Edwards/Emcon Beneficial Use Survey; and
- Determine if any other residences within 2,000 feet in the downgradient direction of the site have wells.

The existence and status of wells were determined by interviewing property owners when possible. If no one was home, the outside of the property was inspected for evidence of a well. The residences within 2,000 feet downgradient of the site were visited. Field notes were recorded on a copy of the Beneficial Use Survey or in a field notebook for residences not included on the survey. Copies of field notes are attached.

Wells either on the Beneficial Use Survey or from Ecology well log files for which existence was either confirmed or potentially confirmed (e.g., the address existed but the owner or neighbor could not be contacted) remained in the database and were reported in the Draft RI (Table 1 and Figure 4). No residences with wells were identified within 2,000 feet in the downgradient direction of the site which were not listed on the Beneficial Use Survey or in Ecology well log files.

F:\docs\jobs\702604\well survey(memo).doc

Attachments:
Sweet-Edwards/EMCON Beneficial Use Survey (1989)
Field Notes, Water Use Field Survey

performed on wells BXS-2 and BXS-4. BXS-2 was selected because the well was completed in a fine sand unit and is believed to be representative of the downgradient wells. Conversely, BXS-4 was completed in a silty sand and was completed in geologic units different from the other three wells. The two wells represent the range in lithology at the Baxter South site.

The withdrawal tests were performed using a 1-inch, 10 foot long PVC (Schedule 200 psi) bailer with a foot valve. The bailer was rapidly withdrawn from the wells. Water levels were monitored with a Hermit Data Logger. The data have been included in Appendix B.

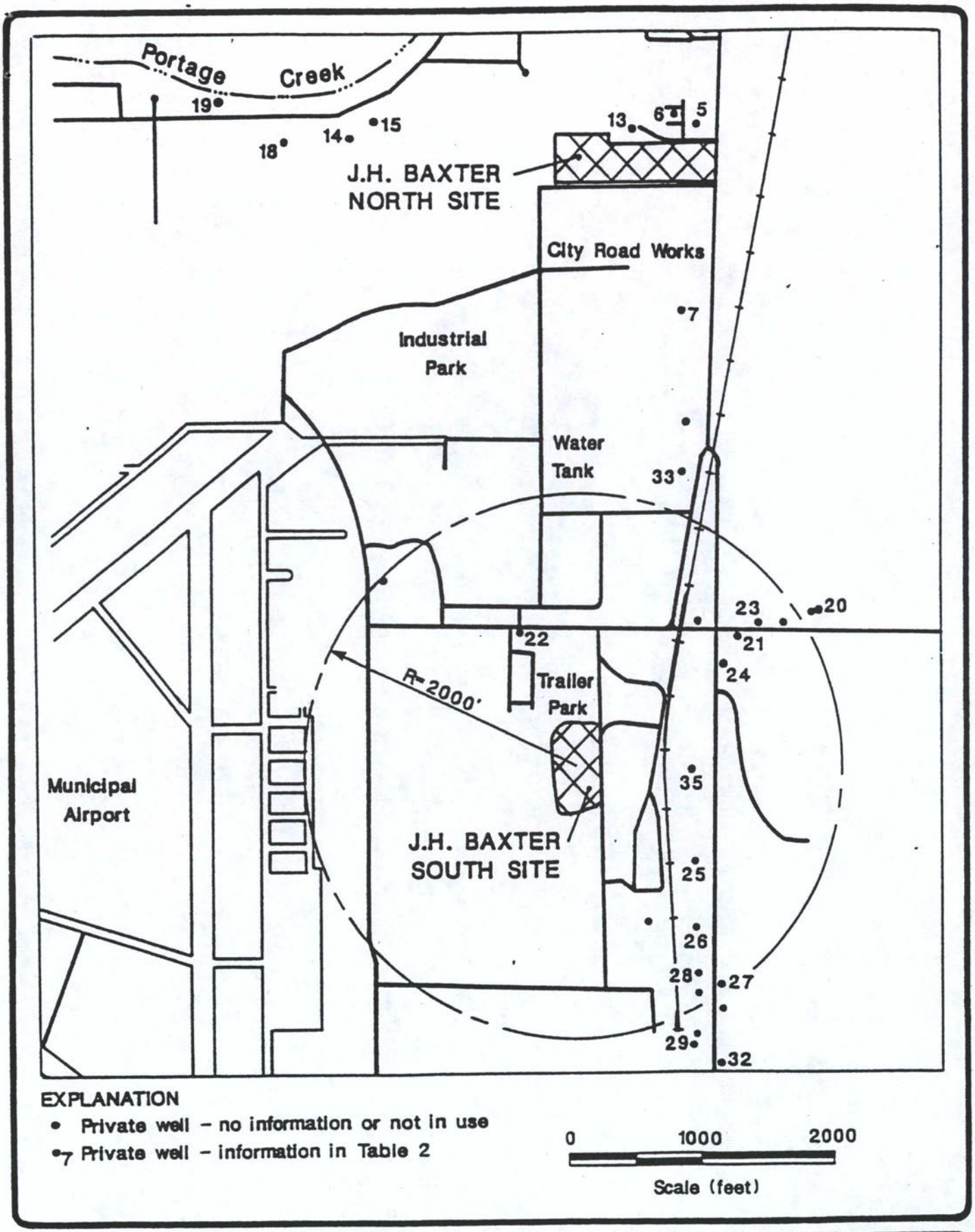
The data were evaluated using the method described by Hvorslev (1951). Vertical and horizontal conductivities were assumed to be the same. The basic time lag was calculated and used in the Time lag Expression (Hvorslev, 1951; p. 47).

The hydraulic conductivities for BXS-2 and BXS-4 were calculated to be 2×10^{-3} cm/sec and 3×10^{-3} cm/sec, respectively. These values are within the range expected for silty sand.

5.5 BENEFICIAL USE

A beneficial use survey was completed as a part of this study. The survey included collection of well logs from Washington State DOE, communication with local water purveyors, and canvassing of homes and businesses within a one-mile radius of the site. A summary of the well information is presented in Table 1 and a map showing location of the wells is presented in Figure 2.

At least fourteen (14) private domestic wells are used within a 2,000 foot radius of the J.H. Baxter South Woodwaste Landfill. Water elevations from accessible domestic wells suggest ground water flow is to the northwest.



Sweet-Edwards
EMCON

Figure 2
J.H. BAXTER LANDFILL
BENEFICIAL USE SURVEY

DATE
9-88
DWN/ APPR
TB/
PROJECT #

Table 1

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
1	(b) (6)	115	40	103	---	Not in Use	
2		130	50	112	---	Not in Use	
5		--- NE	---	---	---	Domestic	No access to well
6		127 t)	---	87	---	Domestic	
7		145 NE	70	92	60-70	Domestic	
8		119	77	76	73-77	Irrigation	Log* pH: 6.66 cond: 298 mmhos
9		---	---	---	---	Domestic	No access to well

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
10	(b) (6)	94	---	74	---	Domestic	pH: 6.34 cond: 298 mmhos
11		114	46	91	---	Domestic	
12		116	---	91	---	Not in use	
13		127	---	85	---	Domestic	
14		120	65	51	---	Domestic	
15		---	---	---	---	Domestic	No access to well

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
16	(b) (6)	110	69	58	---	Domestic	
17		110	69	58	60-69	Domestic	
18		117	---	65	---	Domestic	
19		---	---	---	---	------	No access to well
20		150	30	146	---	Domestic	
21		147	---	126	---	Domestic	
22		---	---	---	---	Domestic	No access to well

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
23	(b) (6)	---	---	---	---	Domestic	No access
24		148	---	132	---		
25		ve 158	20	137	---	Domestic	Log*
26		158	23	148	---	Domestic	
27		---	---	---	---		Well filled in
28		---	---	---	---	Domestic	Community Well - 3 houses
29		140	---	129	---	Domestic	

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
30	(b) (6)	---	---	---	---	Domestic	No access to well
31		---	---	---	---	Domestic	No access to well
32		---	---	---	---	Domestic	
33		145	---	105	---	Domestic	
34		125	---	119	---	Domestic	
35		ts 148	36	133	---	Domestic	

* Notes: 1) Logs are available where noted
2) Wells not shown on Figure 3 are outside of the boundaries of the map

Twelve of the fourteen wells are upgradient and two are downgradient relative to the site. However, the well currently in use by Airway Mobile Park (Well #22), located approximately 200 feet downgradient, may supply up to 54 mobile home units. At this time, it is not known if additional water is supplied to the park by the City of Arlington.

The uppermost aquifer is believed to be the primary source of water in all wells in the area. The aquifer consists of recessional outwash sands and gravels. Depths to water range from 5.42 feet to 20.83 feet below ground surface.

5.6 SITE WATER BALANCE

The Hydrologic Evaluation of Landfill Performance (HELP) model developed by the Environmental Protection Agency was used to calculate a site water balance.

The method is based on the relationship between precipitation, evapotranspiration, surface runoff and soil moisture storage. Since a precise knowledge of all four factors is rarely available and field measurements difficult to obtain, estimations for this study are taken from known site conditions and published data. The following assumptions were made in applying this model:

1. The weather data is that of the Seattle, and Arlington, Washington weather stations (1980 through 1985).
2. The sole source of infiltration is that falling directly on the wood waste surface by precipitation.
3. The wood waste is of uniform thickness (23-feet).
4. The unsaturated formation underlying wood waste materials is 12-feet thick (average thickness is 12-feet extending from base of wood waste to water table).
5. Infiltration is by vertical percolation only.

·5-00)*

① 18930 59th Ave NE – City Water

② } (No wells – Hooked up to
③ (4A) City Water – Based on Interview at ③)*

④ 19040 66th Ave. } (no well)*

⑤ (b) (6) [redacted]

⑥ No name/address / Not home

⑦ Private Well (renter) – may soon be hooked up

(b) (6) [redacted] ⑧ Apple Builders – Not home

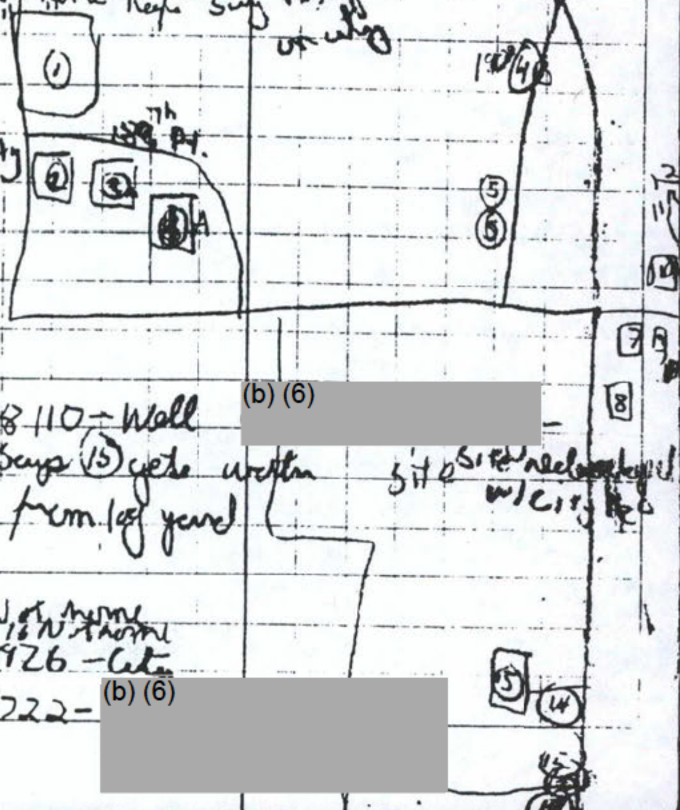
⑨ 6804 ~~Not home~~
⑩ 6803 ← private wells

⑪ 6819 Not home – Keys say Neighbors are on city

⑫ 6823 City

⑬ 6911 ... – City

Airport



⑭ 18110 – Well (b) (6) [redacted]
Says ⑮ gets water from ... years

Site ... w/City ...

⑮ Not home
⑯ 17926 – City
17722 – (b) (6) [redacted]

(b) (6) [redacted]

(b) (6) [redacted] – Well

Note:
(...)* Indicates information added to notes after survey completed based on recollections of surveyor – JJP.

DOMESTIC WELL DETAILS

Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
(b) (6)	115	40	103	---	Not in Use	
	130	50	112	---	Not in Use	
	---	---	---	---	Domestic	No access to well
	127	---	87	---	Domestic	
	145	70	92	60-70	Domestic	
	119	77	76	73-77	Irrigation	Log* pH: 6.66 cond: 298 mmhos
	---	---	---	---	Domestic	No access to well

(b) (6)

(b) (6)

(b) (6)

(b) (6)

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
10	(b) (6)	94	---	74	---	Domestic	pH: 6.34 cond: 298 mmhos
11		114	46	91	---	Domestic	
12		116	---	91	---	Not in use	closed
13		127	---	85	---	Domestic	drink pond address
14		120	65	51	---	Domestic	Yes [illegible]
15		---	---	---	---	Domestic	No access to well

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
16	(b) (6)	110	69	58	---	Domestic	Yes
17		110	69	58	60-69	Domestic	Yes
18		117	---	65	---	Domestic	
19		---	---	---	---	------	No access to well
20		150	30	146	---	Domestic	Only Water
21		147	---	126	---	Domestic	? Well
22		---	---	---	---	Domestic	No access to well Filled

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
23	(b) (6)	---	---	---	---	Domestic	No access see note
24		148	---	132	---		— Nope
25		ve 158	20	137	---	Domestic	Log* Not there
26		158	23	148	---	Domestic	
27		---	---	---	---		Well filled in Not there
28		---	---	---	---	Domestic	Community Well - 3 houses
29		n 140	---	129	---	Domestic	

(b) (6)

Table 1 (cont.)

DOMESTIC WELL DETAILS

Well #	Reported Owner	Approximate Ground Elevation (amsl)	Total Depth (ft)	Approximate Elevation of Piezo Surface (amsl)	Perf/ Screen Interval (ft)	Use	Remarks
30	(b) (6)	---	---	---	---	Domestic	No access to well
31		---	---	---	---	Domestic	No access to well
32		---	---	---	---	Domestic	
33		145	---	105	---	Domestic	No address
34		125	---	119	---	Domestic	
35	(b) (6)	ts 148	36	133	---	Domestic	(b) (6)

* Notes: 1) Logs are available where noted
2) Wells not shown on Figure 3 are outside of the boundaries of the map

APPENDIX B
FIELD WELL INVENTORY AND SAMPLING FORMS

HARTCROWSER
Delivering smarter solutions

Field Well Inventory Sheet
J.H. Baxter Arlington Plant

Ecology Well ID: T ____ N, R ____ ____, Section _____ Well No. _____
Owner _____ Phone No. _____
Address _____ Tax Lot. No. _____
Previous Owner _____ Observer _____ Date _____
Well Location (also see sketch) _____

Well Type (Dug, Drilled) _____ By _____ Date _____
Construction Material _____
Remarks _____

Is well log available? Yes No Is well currently in use? Yes No
What is water used for? _____
Is the property hooked up to City water? _____
Is a pump present? Yes No Type Volume _____
Well Location GPS Coordinates N _____ E _____
Ground Surface Elevation in Feet _____
Well Depth in Feet _____ Data Source _____
Well Diameter in Inches _____
Screened Interval in Feet _____
Static Water Level Depth in Feet _____
Property and Well Access Notes _____

N

Sketch of well location (include lot and building shape, access route, etc.)

Groundwater Sampling Data - Well I.D. _____

Project _____ Date/Time Sampled _____

Job No _____ Tidally Influenced Yes ☐ No ☐

Project Manager _____ Well Depth in Feet _____

Field Reps _____ Screened Interval in Feet _____

① Purging Data/Field Measurements: *All Measurements Relative to Top of Casing (TOC)*

Well Depth _____ Casing Volume in Gallons _____

Depth to Sediment (DTS) in Feet _____ [2" diam = x .163 gal/ft 4" diam = x .653 gal/ft]

Depth to Water (DTW) in Feet _____ Purge Volume in Gallons _____

(DTS – DTW) _____ Actual Purge in Gallons _____

Time	No. of Gallons Purged	pH	Temp in °C	Conduct in _____	Diss. Oxygen in _____	Turbidity	Comments: quality, recovery, color, odor, sheen, accumulated silt/sand
sample:							

Comments: _____

_____

	Method	Pumping Rate in GPM	Depth of Equip. in Feet
Purge			
Sample			

Bails dry? Yes ☐ No ☐

At no. of casing volumes _____

Purge Water Disposal Method/Volume:

_____

_____

_____

② Sampling Data

Bottle Type	# of Containers	Analyses	Preserv.	Filter

Total number of Bottles _____

Duplicate Sample I.D. _____

Field Blank I.D. _____

Rinseate Sample I.D. _____

③ Field Equipment ***Type/Brand/Serial No./Material/Units***

Pump Type/Tubing Type _____ Temp/pH/E.C. meter _____

Bailer Type _____ Water Level Probe _____

Filter Type _____ Other _____

④ Well Conditions OK ☐ Not OK ☐ Explain _____

APPENDIX C
QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PLAN

APPENDIX C
QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PLAN

Quality Objectives and Criteria for Measurement Data

The overall quality assurance objectives for field sampling, field measurements, and laboratory analysis are to produce data of known and appropriate quality to support the site investigation and the selection of remedial alternatives. Appropriate procedures and quality control checks will be used so that known and acceptable levels of accuracy and precision are maintained for each data set. This section defines the objectives for accuracy and precision for measurement data. These goals are primarily expressed in terms of acceptance criteria for the quality control checks performed.

Sample Matrices and Target Analytes

Drinking water samples will be analyzed for pentachlorophenol (PCP) and total tetrachlorophenols using EPA Method 8151A. Sample extracts will be methylated using diazomethane and analyzed by GC/ECD using dual column confirmation. It should be noted that organic acids may interfere with the method and can result in false positive results. These interferences cannot be removed by cleanup procedures.

Reporting limit goals are 0.5 µg/L for PCP and 1.0 µg/L for tetrachlorophenols.

Sample Containers, Preservation, and Holding Times

Samples will be collected in a one liter amber glass bottle with a teflon lined cap. Samples will be preserved by cooling with ice to 4° C. All samples will be extracted within seven days of sample collection and analyzed within an additional 40 days.

Quality Control Requirements

Laboratory QA/QC

The analytical laboratory will conduct a series of QA/QC checks on the data. These include, but are not limited to: analysis of surrogate compounds, method blanks, matrix spikes, and matrix spike duplicates. Laboratory QC checks and acceptance criteria are presented in Table C-1.

Field QA/QC

Hart Crowser will employ a series of field QA/QC measures to ensure sample integrity during collection, storage, and shipping to the analytical laboratory. These procedures will ensure the sample is representative of the intended water supply well and was not compromised by procedural artifacts. Field quality control samples will include "blind" duplicate samples and, if non-dedicated sampling equipment is used for water samples, water equipment rinse (decontamination) blanks. Temperature blanks will be included in each sample shipment to the laboratory. Field QC checks and acceptance criteria are presented in Table C-1.

Laboratory Documentation

The laboratory data reports will consist of a Tier 4 data package. Tier 4 reports contain complete documentation and raw data to allow independent data reduction and verification of analytical results from laboratory bench sheets and instrument raw data outputs. Each laboratory data report will include the following:

- Case narrative identifying the laboratory analytical batch number; matrix and number of samples included; analyses performed and analytical methods used; description of any problems or exceedence of QC criteria and corrective action taken. The laboratory manager or their designee must sign the narrative.

- Copy of chain of custody forms for all samples included in the analytical batch.

- Tabulated sample analytical results with units, data qualifiers, percent solids, sample weight or volume, dilution factor, laboratory batch and sample number, Hart Crowser sample number, and dates sampled, received, extracted, and analyzed all clearly specified. Surrogate percent recoveries will be included for organic analyses.

- Blank summary results indicating samples associated with each blank.

- Matrix spike/matrix spike duplicates result summaries with calculated percent recovery and relative percent differences.

- Laboratory control sample results, when performed, with calculated percent recovery.

- Electronically formatted data deliverable (diskette) results.

Data Validation

Analytical data generated by laboratories will undergo a QA/QC review by Hart Crowser chemists. Data validation results will be documented in memoranda reports. Data will be verified by the project QA chemist by reviewing and comparing results entered into the analytical database with validation memoranda prior to subsequent data reduction and evaluation.

A Level I data review of data precision and accuracy will be performed on all results using quality control summary sheet results provided by the laboratory for each data package. Level I review is based on the quality control criteria and format of the EPA National Functional Guidelines for Inorganic and Organic Data Review modified to include specific criteria of individual analytical methods. Raw data (instrument tuning, calibrations, chromatograms, spectra, instrument printouts, bench sheets and laboratory worksheets) are not reviewed. If outliers occur during calibration or calibration verification, the laboratory will note the incident in the data narrative and professional judgment will be used to determine any necessary actions. The following is an outline of a Level I review:

- Verify sample numbers and analyses match the chain of custody request;
- Verify sample preservation and holding times;
- Verify that field and laboratory blanks were performed at the proper frequency and that no analytes were present in the blanks;
- Verify field and laboratory duplicates, matrix spikes, and laboratory control samples were run at the proper frequency and that control limits were met;
- Verify surrogate compound analyses have been performed and that results met the QC criteria;
- Verify required limits of detection limits have been achieved; and
- Data validation qualifier flags, beyond any applied by the laboratory, will be added to sample results that fall outside the QC acceptance criteria

Data validation qualifier flags, beyond any applied by the laboratory, will be added to sample results that fall outside the QC acceptance criteria.

Data validation reports documenting data quality will be prepared for each laboratory data package as it is received. Copies will be submitted to the Hart Crowser Project Manager for incorporation into the monthly progress report submitted to EPA.

Analytical Data Reports

Validated analytical results will be provided to all well users with a copy to the EPA Project Manager within 30 days of the date of sample collection.

F:\docs\jobs\702604\DrinkingWaterSamplingPlan.doc

Table C-1 - Summary of Quality Control Procedures, Criteria, and Corrective Actions for Chlorinated Phenols Analysis

Chlorinated Phenols – EPA 8151A mod GC/ECD			
Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Field Quality Control			
Rinse blank	1 every 20 or fewer field samples (water only) collected with non-dedicated equipment	All analytes < reporting limit	Evaluate data for useability
Duplicate	1 every 20 or fewer field samples	Water - ≤ 35% RPD	Evaluate data for useability
Temperature blank	1 in every cooler shipped	Temperature = 4°C ± 2 °C	Evaluate data for useability
Laboratory Quality Control			
Method blank	1 per batch of every 20 or fewer samples	All analytes < reporting limit	Re-extract and reanalyze associated samples unless concentrations are > 5 x blank level
Initial calibration	5-point external calibration prior to analysis of samples	%RSD < 25%	Recalibrate instrument
Continuing calibration	Every 10 samples with mid-range standard	% Difference ≤ 20% of initial calibration	Recalibrate instrument and re-analyze affected samples
System monitoring compounds (surrogates)	4-Bromo-2,6-dichlorophenol Every lab and field sample	Water- 40 – 100% recovery Soil- 15 – 138% recovery	Evaluate data for useability
Retention time windows	All samples and continuing calibration checks	±0.06 relative retention time units (sample and standard)	Reanalyze affected samples
Matrix spike	1 per batch of every 20 or fewer samples	See Table C-2	Evaluate data for useability
Matrix spike duplicate	1 per batch of every 20 or fewer samples	See Table C-2	Evaluate data for useability
Laboratory control sample	1 per batch of every 20 or fewer samples	See Table C-2	Evaluate data for useability

Table C-2 - Laboratory Control Limits for Matrix Spikes, Matrix Spike Duplicates, and Surrogate Spikes

Analysis/Method	Spike/Surrogate Compound	Advisory Limits	
Chlorinated Phenols 8151 modified		Percent Recovery	RPD
	Matrix Spike/Matrix Spike Duplicate		
	Tetrachlorophenols	50 - 150	35
	Pentachlorophenol	33 - 128	35
	Laboratory Control Sample		
	Tetrachlorophenols	38 - 128	
	Pentachlorophenol	41 - 115	
	Surrogates		
	4-Bromo-2,6-dichlorophenol	40 - 100	